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Claim PTO/tw

1. A method for printing a document in a data communications system, the system including a processing unit including a printer client (1001) and a printer including a printer server (1002), the processing unit and the printer using for communication between each other a wireless printer protocol, the Bluetooth protocol stack and air interface, the Bluetooth protocol stack including a wireless printer protocol and a Logical Link Control and Adaptation Protocol (L2CAP), the method including the steps of:
5 establishing (701) a bi-directional wireless asynchronous connection-less (ACL) connection between the processing unit and the printer by means of the printer protocol
10 calling the L2CAP requesting the connection and the L2CAP creating the connection;
establishing (702) a connection for one or more printjobs between the printer client (1001) and the printer server (1002);
20 negotiating (703) configuration parameters between the printer client (1001) and the printer server (1002);
sending (704) keep alive messages frequently from the printer client (1001) to the printer server (1002) and from the printer server (1002) to the printer client (1001);
25 starting (705) a print job;
sending (706) the print data from the processing unit to the printer;

stopping (707) the print job; and
closing (708) the connection between the processing unit and the printer.

3. The method according to claim 1, comprising the further step to be taken before the step of establishing (701) a bi-directional wireless ACL connection:

selecting a printer among a number of available printers.

3. The method according to claim 2, wherein the step of selecting a printer is performed by using the Device Discovery Protocol.

--4. (Amended) The method according to claim 1, comprising the further step to be taken before the step of establishing (701) a bi-directional wireless ACL connection:
obtaining an address of a printer.--

Art Unit: 2635

5. The method according to claim 4, wherein the step of obtaining an address of a printer is performed by using the Device Discovery Protocol.

6. The method according to claim 5, wherein the establishing a connection for one or more printjobs is performed by sending a connection request message (1003) from the printer client (1001) to the printer server (1002).

7. The method according to claim 6, wherein the establishing a connection for one or more printjobs is performed by responding upon the request whether the connection was successful or not, in a response message (1004) sent from the printer server (1002) to the printer client (1001).

--8. (Amended) The method according to claim 1, wherein the step of negotiating configuration parameters (503), between the printer client (1001) and the printer server (1002), is performed by the printer client (1001) requesting configuration in a message (1101) sent to the

printer server (1002), the message including no new options, if printer client (1001) uses default values.--

Amend claim 9 as follows:

--9. (Amended) The method according to claim 1, wherein the step of negotiating configuration parameters(503), between the printer client (1001) and the printer server (1002), is performed by the printer client (1001) requesting configuration in a message (1103) sent to the printer server (1002), the message including a suggestion of configuration options.--

10. The method according to claim 9, wherein said configuration request is responded to by the printer server (1002) in a message (1102, 1104, 1106) indicating whether the configuration options in the configuration request are supported by the printer server (1002) or not.

11. The method according to claim 10, including the further step, if the configuration request responds failure; sending a further configuration request message (1105, 1109) from the printer client (1001) to the printer server (1002), the message including suggestion of configuration options which differs from earlier suggestions of configuration options..

--12 (Amended) The method according to claim 1, comprising the further step to be taken after the step of negotiating configuration parameters (503): sending a set attribute request message (1201) from the printer client (1001) to the printer server (1002) the message comprising a coding table concerning a negotiated coding type.--

13. Method according to claim 12, comprising the further step of: the printer server (1002) loading the coding table by means of said received set attribute request message (1201).

14. Method according to claim 13, comprising the further step of: sending a response whether the loading of the coding table was successful or not in a message (1202) from the printer server (1002) to the printer client (1001).

--15 (Amended) The method according to claim 1, wherein a keep alive timer is implemented in the printer client (1001) and in the printer server (1002), comprising the further step of :

starting the keep alive timer each time a valid message is received from the remote endpoint.--

16. The method according to claim 15, wherein said keep alive timer expires, comprising the further step of: closing the connection.

Art Unit: 2635

--17 (Amended) The method according to claim 1, wherein the step of starting a print job (505) is performed by the printer client (1001) requests the printer server (1002) to start a printjob in a request message (1305).--

18. The method according to claim 17, wherein said start printjob request message (1305) is received and confirmed by the printer server (1002), the confirmation sent in message (1306) to the printer client (1001).

--19. (Amended) The method according to claim 1, wherein the step of sending the print data from the processing unit to the printer (506), is performed by requesting the printer server (1002) to print data sent in a number of messages (1307, 1308, 1310).--

20 The method according to claim 19, comprising the further step to be taken after the printer server (1002) have

received a previous decided number of print data request messages:
sending an acknowledgement message (1309) from the printer server (1002) to the printer client (1001).

--21. (Amended) The method according to claim 1, comprising the further step to be taken if the printer runs out of paper:
indicating that the printer is out of paper in a message (1406) sent from the printer server (1002) to the printer client (1001).--

22. The method according to claim 21, comprising the further step to be taken when the printer is refilled:
indicating that the printer is refilled in a message (1407) sent from the printer server (1002) to the printer client (1001).

Art Unit: 2635

23. The method according to claim 22, comprising the further step to be taken after the printer client (1001) has received an indication message (1407) that the printer is refilled:

continuing the printing process by continuing to send print data request messages, (1408, 1409) starting with the print data subsequent to the last received print data acknowledgement message (1405).

--24. (Amended) The method according to claim 1, wherein the ACL connection is disconnected during printing,

the method comprising the further step of:

stopping the keep alive timer.--

25. The method according to claim 24, wherein a new ACL connection is created comprising the further step of:

requesting a reconnection of the session defined by the session identifier in a message (1506) sent from the printer client (1001) to the printer server (1002).

26. The method according to claim 25, comprising the further step of:

sending a response according to whether the reconnection is granted or not in a message (1507) from the printer server (1002) to the printer client (1001).

27. The method according to claim 26, comprising the further step to be taken after the printer client (1001) has received a granted reconnection response:

continuing the printing process by continuing to send print data request messages (1508, 1509), starting with the print data subsequent to the last received print data acknowledgement message (1505).

--28. (Amended) The method according to claim 1, wherein the step of stopping the print job (707), is performed by, after sending all data to be printed to the printer server (1002), sending a request to stop the print job in a message (1311) from the printer client (1001) to the printer server (1002).--

Art Unit: 2635

29. The method according to claim 28, comprising the further step to be taken after the printer server (1002) has received a request to stop the printjob; sending a response message (1312), comprising a confirmation that this is apprehended, from the printer server (1002) to the printer client (1001).

--30. (Amended) The method according to claim 1, wherein the step of closing the connection between the processing unit and the printer (708) is performed by the printer client (1001) requesting a disconnection of the session defined by the session identity in a message (1313) sent to the printer server (1002).--

31. The method according to claim 30, wherein the printer server responds to whether the disconnection was granted or not, in a response message (1314) sent from the printer server (1002) to the printer client (1001).

--32. (Amended) The method according to claim 1, comprising the further step to be taken after the step of closing the connection between the processing unit and the printer (708): stopping the sending of keep alive messages.--

Amend claim 33 as follows:

--33. (Amended) A computer program product directly loadable into the internal memory of a digital computer within a processing unit or printer in a communication system, comprising the software code portions for performing the steps of claim 1, when said product is run on a computer.--

Amend claim as follows:

--34. (Amended) A computer program product stored on a computer usable medium, comprising readable program for causing a computer within a processing unit or printer in a communication system, to control an execution of the steps of claim 1.--

Art Unit: 2635

15. An entity (501) included in a Processing unit (402), the entity includes a Bluetooth protocol stack comprising a Logical Link Control and Adaptation Protocol (L2CAP) **characterised** in that the Bluetooth protocol stack further comprises a wireless printer protocol, said printer protocol comprising a printer client which communicates (803) with a printer server, included in a printer (403), by means of the Bluetooth protocol stack and air interface, the entity (501) further comprises:

an establishing device (502) arranged for establishing a bi-directional wireless ACL connection to the printer (403) by calling the L2CAP requesting the connection;

an establishing device (503) arranged for establishing a connection for one or more printjobs

a negotiating device (504) arranged for negotiating configuration parameters with a printer server within the printer(403);

a sending device (509) arranged for sending keep alive messages frequently to the printer server ;

a starting device (513) arranged for starting a print job;

a sending device (515) arranged for sending the print data to the printer server;

a stopping device (520) arranged for stopping the print job; and

a closing device (522) arranged for closing the connection between the processing unit (402) and the printer (403).

16. The entity (501) according to claim 15, **characterised** by comprising a sending device arranged for sending a connection request message from the printer client to the printer server.

--37. (Amended) The entity (501) according to claim 15, wherein when negotiating configuration parameters, the printer client uses default values, **characterised** by comprising a sending device (505) arranged for sending a configuration request message to the printer server, the message including no new options.--

Amend claim 38 as follows:

--38. (Amended) The entity (501) according to claim 15, **characterised** by comprising a sending device (506) arranged for sending a configuration request message to the printer server, the message including a suggestion of configuration options.--

Art Unit: 2635

39. (Amended) The entity (501) according to claim 35, **characterised** by comprising a sending device (507) arranged for sending a further configuration request to the printer server, the message including suggestion of configuration options which differs from earlier suggestions of configuration options.--

Amend claim 40 as follows:

--40. (Amended) The entity (501) according to claim 35, **characterised** by comprising a sending device (508) arranged for sending a set attribute request message to the printer server, the message comprising a coding table concerning a negotiated coding type.--

Amend claim 41 as follows:

--41. (Amended) The entity (501) according to claim 35, **characterised** in that a keep alive timer (510) is implemented in the printer client.--

42. The entity (501) according to claim 41, **characterised** by comprising a starting device (511) arranged for starting the keep alive timer (510) each time a valid message is received from the printer (403).

43. The entity (501) according to claim 42, **characterised** by comprising a closing device (512) arranged for closing the connection between the printer client and the printer server, when the keep alive timer(510) expires.

--44. (Amended) The entity (501) according to claim 35, **characterised** by comprising a sending device (514) arranged for sending a request message to the printer server comprising a request to start a printjob.--

Amend claim 45 as follows:

--45. (Amended) The entity (501) according to claim 35, **characterised** by comprising a sending device (516) arranged for sending a number of request messages to the

Art Unit: 2635

printer server, the messages comprising print data.--

Amend claim 46 as follows:

--46. (Amended) The entity (501) according to claim 35, wherein a refill of paper has broken a printing process, **characterized** by comprising a continuing device (517) arranged for continuing the printing process by continuing to send print data request messages to the printer server, starting with the print data subsequent to the last received print data acknowledgement message.--

47. The entity (501) according to claim 41, **characterized** by comprising a stopping device (518) arranged for stopping the keep alive timer when the ACL connection is disconnected during a printing process.

--48. (Amended) The entity (501) according to claim 35, wherein a new ACL connection is created to the printer after a break, **characterized** by comprising a requesting device (519) arranged for requesting a reconnection of a session defined by the session identifier in a message sent to the printer server.--

49. The entity (501) according to claim 48, wherein a granted reconnection response message is received, **characterized** by comprising a continuing device (517) arranged for continuing the printing process by continuing to send print data request messages to the printer server, starting with the print data subsequent to the last received print data acknowledgement message.

--50. (Amended) The entity (501) according to claim 35, wherein all data to be printed is sent to the printer **characterized** by comprising a sending device (521) arranged for sending a message to the printer server, the message comprising a request to stop the printjob.--

Amend claim 51 as follows:

--51. (Amended) The entity (501) according to claim 35, **characterized** by comprising a sending device (523)

Art Unit: 2635

arranged for sending a message to the printer server, the message comprising a request to disconnect a session identified by a session identity.--

Amend claim 52 as follows:

--52. (Amended) The entity (501) according to claim 35, **characterised** by comprising a stopping device (524) arranged for stopping the sending of keep alive messages after closing a connection between the printer client and the printer server.--

53. A printer entity (601) included in a Printer (403), the printer entity (601) including a Bluetooth protocol stack comprising a Logical Link Control and Adaptation Protocol (L2CAP) **characterised** in that the Bluetooth protocol stack further includes a wireless printer protocol, said printer protocol comprising a printer server which communicates with a printer client, included in a processing unit (402), by means of the wireless printer protocol, the Bluetooth protocol stack and air interface, the printer entity (601) further comprises:

- a negotiating device (605) arranged for negotiating configuration parameters with a printer client within the processing unit;
- a sending device (609) arranged for sending keep alive messages frequently to the printer client ;
- a starting device (612) arranged for starting a print job;
- a receiving device (614) arranged for receiving print data from the printer client; and
- a stopping device (620) arranged for stopping the print job.

54. The printer entity (601) according to claim 53 **characterised** in comprising a responding device (606)

arranged for responding upon a connection request whether the connection is successful or not, in a response message sent to the printer client.

--55. (Amended) The printer entity (601) according to claim 53, **characterised** in comprising a responding device (606) arranged for responding upon a configuration request whether the configuration options in the configuration request are supported by the printer server or not.--

Amend claim 56 as follows:

--56. (Amended) The printer entity (601) according to claim 53, **characterised** in comprising a loading device (607) arranged for loading a coding table sent from the printer client.--

Art Unit: 2635

57. The printer entity (601) according claim 56 characterised in comprising a sending device (608) arranged for sending a response whether the loading of the coding table was successful or not to the printer client.

--58. (Amended) The printer entity (601) according to claim 53, characterised in that a keep alive timer (610) is implemented in the printer server.--

59. The printer entity (601) according to claim 59, characterised by comprising a starting device (611) arranged for starting the keep alive timer each time a valid message is received from the printer.

--60. (Amended) The printer entity (601) according to claim 51, characterised in comprising a confirming device (613) arranged for confirming a start printjob request message sent to the printer client.--

Amend claim 61 as follows:

--61. (Amended) The printer entity (601) according to claim 53, characterised in comprising a sending device (615) arranged for sending an acknowledgement message to the printer client after receiving a previous decided number of print data request messages.--

Amend claim 62 as follows:

--62. (Amended) The printer entity (601) according to claim 53, characterised in comprising an indicating device (616) arranged for indicating, in a message sent to the printer client, that the printer is out of paper, if the printer runs out of paper.--

--63. (Amended) The printer entity (601) according to claim 53, characterised in comprising an indicating device (617) arranged for indicating, in a message sent to the printer client, that the printer is refilled, when the printer is refilled.--

Amend claim 64 as follows:

--64. (Amended) The printer entity (601) according to claim 51, characterised by comprising a stopping device

Art Unit: 2635

(619) arranged for stopping the keep alive timer when an ACL connection to the processing unit is disconnected during a printing process.--

Amend claim 65 as follows:

--65. (Amended) The printer entity (601) according to claim 53, **characterised** in comprising a sending device (619) arranged for sending a response message to the printer client, according to whether a reconnection request is granted or not.--

Amend claim 66 as follows:

--66. (Amended) The printer entity (601) according to claim 53, **characterised** in comprising a sending device (621) arranged for sending a response message, after the printer server has received a request to stop the printjob, the message comprising a confirmation that this is apprehended and is sent to the printer client.--

--67. (Amended) The printer entity (601) according to claim 53, **characterised** in comprising a sending device (622) arranged for sending a response message to the printer client, according to whether a disconnection request is granted or not.--

Amend claim 68 as follows:

--68. (Amended) The printer entity (601) according to claim 53, **characterised** in comprising a stopping device

Art Unit: 2635

(623) arranged for stopping the sending of keep alive messages after the connection to the printer client is closed.--

Amend claim 69 as follows:

--69. (Amended) Communications system (401) **characterised** by comprising a processing unit (501) according to claim 15 and a printer entity (601) included in a Printer (403), the printer entity (601) including a Bluetooth protocol stack comprising a Logical Link Control and Adaptation Protocol (L2CAP) **characterised** in that the Bluetooth protocol stack further includes a wireless printer protocol, said printer protocol comprising a printer server which communicates with a printer client, included in a processing unit (402), by means of the wireless printer protocol, the Bluetooth protocol stack and air interface, the printer entity (601) further comprises:

a negotiating device (605) arranged for negotiating configuration parameters with a printer client within the processing unit;

a sending device (606) arranged for sending keep alive messages frequently to the printer client ;

a starting device (612) arranged for starting a print job;

a receiving device (614) arranged for receiving print data from the printer client; and

a stopping device (620) arranged for stopping the print job.--